

## CLAIMS:

1. A waste energy recovery assembly, comprising:  
a first plate having flow channels defined at one side thereof,  
said flow channels of said first plate being orientated in a first direction, said  
first plate having a supply opening and an exhaust opening therein, said exhaust  
5 opening of said first plate positioned for communicating with said flow  
channels of said first plate; and  
a second plate having flow channels defined at one side of said  
second plate, said flow channels of said second plate being orientated in a  
second direction, said second plate having a supply opening and an exhaust  
10 opening therein, said supply opening of said second plate positioned for  
communicating with said flow channels of said second plate, said second plate  
being disposed in thermal communication with said first plate with said supply  
opening of said second plate aligning with said supply opening of said first plate  
and with said exhaust opening of said second plate aligning with said exhaust  
15 opening of said first plate.
2. The waste energy recovery assembly of Claim 1 wherein  
said flow channels in each of said first plate and said second plate are defined  
by etchings in said first plate and etchings in said second plate.
3. The waste energy recovery assembly of Claim 2 wherein  
said etchings are shaped to induce a swirl into a flow.
4. The waste energy recovery assembly of Claim 2 wherein  
said etchings form a geometric pattern.
5. The waste energy recovery assembly of Claim 4 wherein  
said geometric patterns include an S-shape pattern, a serpentine pattern, a  
chevron pattern, or a wave-form pattern.

6. The waste energy recovery assembly of Claim 1 wherein said first direction is perpendicular to said second direction.

7. The waste energy recovery assembly of Claim 1 wherein said supply opening in each of said first plate and said second plate comprises an anode supply opening and a cathode supply opening.

8. The waste energy recovery assembly of Claim 7 wherein:  
said flow channels in said second plate includes anode supply  
flow channels and cathode supply flow channels;

5 said anode supply opening comprises an anode supply opening in  
and an anode supply opening out positioned for communication with said anode  
supply flow channels; and

said cathode supply opening comprises a cathode supply opening  
in and a cathode supply opening out positioned for communication with said  
cathode supply flow channels.

9. The waste energy recovery assembly of Claim 8 wherein  
said second plate further includes:

a rib separating said anode supply flow channels from said  
cathode supply flow channels.

10. The waste energy recovery assembly of Claim 1 wherein  
said first direction is different than said second direction.

11. A method of waste energy recovery, comprising:  
communicating an exhaust received at an exhaust opening in a  
first plate through exhaust flow channels defined at one side of said first plate to  
an exhaust opening out of said first plate, said exhaust flow channels being  
5 orientated in a first direction;  
communicating an oxidant received at an anode supply opening  
in a second plate through anode supply flow channels defined at one side of said  
second plate to an anode supply opening out of said second plate, said anode  
supply flow channels being orientated in a second direction, said second plate  
10 being disposed in thermal communication with said first plate;  
communicating a reformat received at a cathode supply opening  
in said second plate through cathode supply flow channels defined at said one  
side of said second plate to an anode supply opening out of said second plate,  
said cathode supply flow channels being orientated in said second direction; and  
15 whereby said oxidant and said reformat are heated.
12. The method of Claim 11 wherein said exhaust flow  
channels are defined by etchings in said first plate, and said anode supply flow  
channels and said cathode supply flow channels are defined by etchings in said  
second plate.
13. The method of Claim 11 wherein said first direction is  
different than said second direction.
14. The method of Claim 11 wherein said first direction is  
perpendicular to said second direction.
15. The method of Claim 12 further comprising:  
inducing a swirl into at least one of said exhaust, said oxidant, or  
said reformat.